Still the matter is left indeterminate from the statical standpoint. From the dynamical standpoint, however, we are led to a certain definite stress distribution, which is also, fortunately, free from the above objection, and is harmonised with the flux of energy. A peculiarity is the way the force on an intrinsic magnet is represented. It is not by force on its poles, nor on its interior, but on its sides, referring to a simple case of uniform longitudinal magnetisation; *i.e.*, it is done by a *quasi*-electromagnetic force on the fictitious electric current which would produce the same distribution of induction as the magnet does. There is also a force where the inductivity varies. This force on fictitious current harmonises with the conclusion previously arrived at by the author that, when impressed forces set up disturbances, such disturbances are determined by the curl of the impressed forces, and proceed from their localities.

In conclusion it is pointed out that the determinateness of the stress rests upon the assumed localisation of the energy and the two laws of circuitation, so that with other distributions of the energy (of the same proper total amounts) other results would follow; but the author has been unable to produce full harmony in any other way than that followed.

VI. "Comparison of Simultaneous Magnetic Disturbances at several Observatories, and Determination of the Value of the Gaussian Functions for those Observatories." By W. Grylls Adams, D.Sc., F.R.S., Professor of Natural Philosophy in King's College, London. Received June 11, 1891.

(Abstract.)

After drawing attention to previous investigations on this subject, and pointing out the importance of adopting the same scale values for similar instruments at different Observatories, especially at new Observatories which have been recently established, the discussion of special magnetic disturbances is undertaken, especially the disturbances of a great magnetic storm which occurred on June 24 and 25, 1885, for which photographic records have been obtained from 17 different Observatories: 11 in Europe, 1 in Canada, 1 in India, 1 in China, 1 in Java, 1 at Mauritius, and 1 at Melbourne.

The records are discussed and compared, tables are formed of the simultaneous disturbances, and the traces are reduced to Greenwich mean time and brought together on the same plates arranged on the same time-scale. Plates I and II show the remarkable agreement between the disturbances at the different Observatories, and the

Tables show that the amount of disturbance, especially of horizontal magnetic force, is nearly the same at widely distant stations.

An attempt has also been made to apply the Gaussian analysis to sudden magnetic disturbances, and, with a view to their application in future work, the values of the Gaussian functions have been obtained for 20 different Observatories, and the numerical equations formed for the elements of magnetic force in three directions mutually at right angles, and also the equation for the magnetic potential in terms of the Gaussian coefficients to the fourth order.

The Tables give the numerical values to be multiplied by the 24 Gaussian coefficients to give the values of the forces X, Y, and Z in the geographical meridian towards the north, perpendicular to the meridian towards the west, and vertically downwards respectively. The equations are also formed and the values obtained in terms of the 24 Gaussian coefficients for X_2, Y_2, and Z_2, X_2 being the horizontal force in the magnetic meridian, Y_2 the horizontal force perpendicular to the magnetic meridian, and Z_2 the vertical force. If then X_2, Y_2, and Z_2 be the observed values of any simultaneous disturbances, they may be at once substituted in the equations, the equations giving the 24 Gaussian coefficients may be solved, and the corresponding change of magnetic potential may be determined.

VII. "On the Measurement of the Heat produced by Compressing Liquids and Solids." By the late Cosmo Innes Burton, B.Sc., F.C.S., Professor of Chemistry, Polytechnic, Shanghai, and William Marshall, B.Sc., F.C.S. Communicated by Professor Thorpe, F.R.S. Received June 10, Read June 18, 1891.

In the year 1885 Messrs. Creelman and Crocket ('Edinburgh Roy. Soc. Proc.,' vol. 13. p. 311), under Professor Tait's supervision, performed a series of experiments on the heat produced by the compression of various substances. Their method was briefly as follows:—For the application of the pressure, the same apparatus which we describe and figure later was used. A thermo-electric junction of insulated nickel and iron wires was fixed between the leather washers and a sufficient length of wire coiled away inside the gun to allow the junction to be drawn out at the top and a specimen attached to it. Among the substances examined were glass, cork, vulcanite, glue, bees'-wax, and paraffin oil, the only pure chemical compounds being chloroform and ether. The following are some of the results obtained. Pressure, about 1 ton on the square inch.